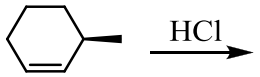
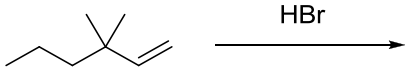
The pi bonds of alkenes and alkynes tend to act as nucleophiles in chemical reactions. In this worksheet you will focus on typical electrophilic addition reactions of alkenes. (NOTE: Not all instructors cover every one of these reactions.)

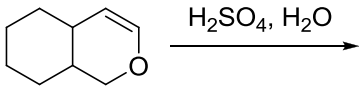
1. a) Draw out the products for the following hydrogen halide addition reactions. It is a good idea to draw out each step in the mechanism. . b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions?

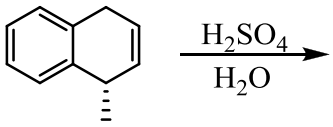




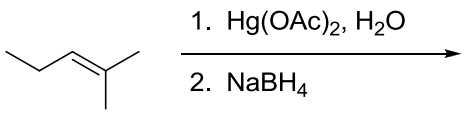
d) How would you change the conditions of the reaction to get the anti-Markovnikov product in the second reaction above? What makes this reaction different from the ones above?

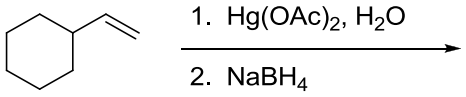
2. a) Draw out the products for the following acid-catalyzed water addition reactions. It is a good idea to draw out each step in the mechanism. b) What factors influence the position of the charges on the intermediate(s)? c) What are the stereochemical factors you must remember when performing these reactions?



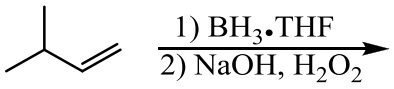


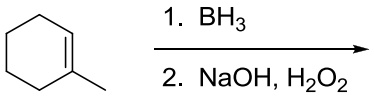
3. a) Draw out the products for the following oxymercuration-demercuration reactions. b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions?



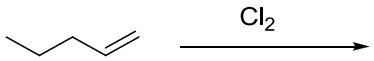


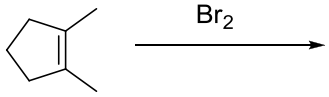
4. a) Draw out the products for the following hydroboration reactions. b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions?



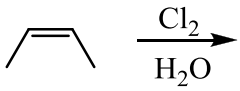


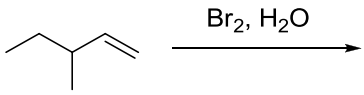
5. a) Draw out the products for the following halogen addition reactions. b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions?



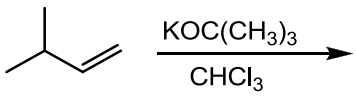


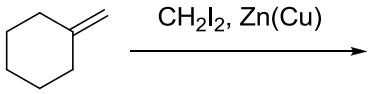
6. a) Draw out the products for the following halohydrin formation reactions. b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions? What would change if you substituted methanol (MeOH) for water in this reaction?



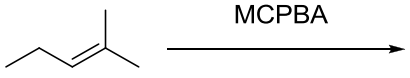


7. a) Draw out the products for the following carbene addition reactions. b) Do these reactions involve rearrangements? c) What are the important factors you must remember when performing these reactions?

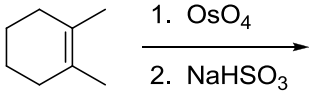


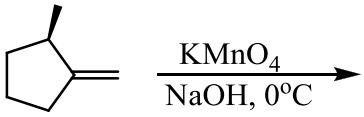


8. a) Draw out the products for the following epoxide formation reaction. b) Do these reactions involve rearrangements? c) What are the important factors you must remember when performing this reaction?

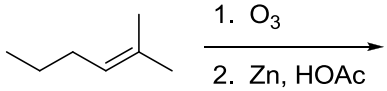


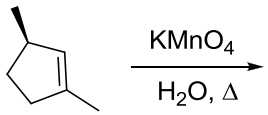
9. a) Draw out the products for the following diol formation reactions. b) Do these reactions involve rearrangements? c) What are the stereochemical and regiochemical factors you must remember when performing these reactions?



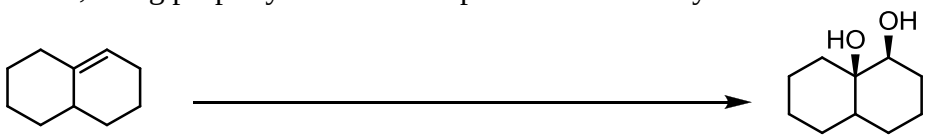


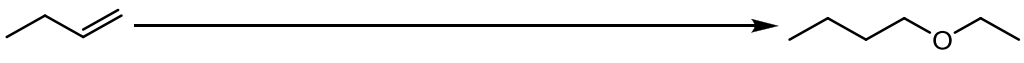
10. a) Draw out the products for the following oxidative cleavage reactions. b) What are the important factors you must remember when performing these reactions?

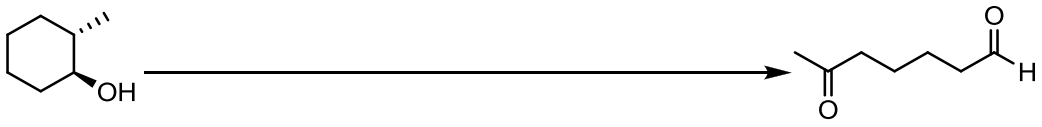


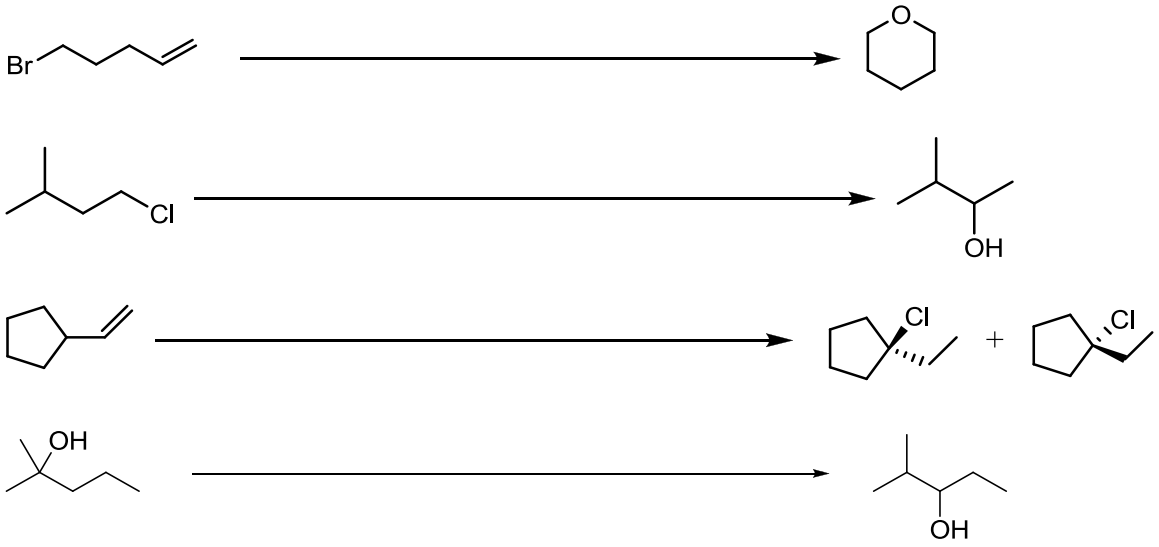


Putting it all together, Synthesis Problems: Fill in the missing reagent(s) for the following reactions, using properly numbered steps where necessary.









Putting it all together, Mechanism Problems: Give the step-by-step mechanism for each reaction below. Be sure to include all intermediates, charges, and curved arrows needed to explain the transformation.